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FILED

MAR 06 2019

UNITED STATES BANKRUPTCY COURT
SAN FRANCISCO, CA

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7 **UNITED STATES BANKRUPTCY COURT**
8 **NORTHERN DISTRICT OF CALIFORNIA**
9 **SAN FRANCISCO DIVISION**

10 In re:

11 PG&E CORPORATION and PACIFIC GAS
AND ELECTRIC COMPANY,

12 Debtors.

) Case No.: 19-30088 (DM)

) Chapter 11

) **SUPPLEMENTAL AMICUS BRIEF**

) Date Action Filed: January 29, 2019
) Hon. Dennis Montali

15
16 Petitioner Andrew Paul Kangas hereby submits the following supplemental amicus brief
17 in the matter of Pacific Gas and Electric Company (hereafter PG&E) in the United States
18 Bankruptcy Court, Northern District of California, San Francisco Division. Paul Kangas is a
19 PG&E shareholder.

20 Petitioner draws the Court's attention to the threat of a nuclear meltdown posed by
21 PG&E's Diablo Canyon Nuclear Power Plant Units #1 and #2. At this time PG&E is not
22 operating Unit # 1 while it is being refueled.¹ Petitioner does not know how long it will take for
23 PG&E to refuel the reactor. The shutdown coincides with the United States Nuclear Regulatory
24 Commission's requirement that PG&E conduct scheduled testing of the welds throughout the
reactor's stainless steel pressure vessel and piping.

25 Petitioner requests that the Court issue a temporary injunction to stop the reactor from
26 returning to full power operation until an independent entity conducts adequate and public

27
28 ¹ PG&E announced Unit #1 at Diablo Canyon shut down for refueling February 10, 2019 –
PG&E website.

1 testing of the reactor's potential for safe operation.

2 This supplemental filing explains two types of metallurgical dangers PG&E is ignoring at
3 the Diablo Canyon Nuclear Facility.

4 The first danger is referred to in the profession of nuclear power and regulation as
5 "Embrittlement" that can cause the stainless steel in nuclear reactors to break causing a nuclear
6 accident.² The second is that since 2010 PG&E has operated the reactors without adequate shut
7 down procedures in the event of an earthquake along the fault line the reactor was built on.

8 "PG&E and the NRC are ignoring the severely degraded condition by allowing Diablo
9 Canyon Unit #1 to operate."³ "It is disturbing that the alleged 'solution' created by the
10 NRC and Pacific Gas and Electric to protect Unit 1 against its increasing neutron
11 embrittlement, is simply to create administrative controls that require Diablo Canyon
12 atomic reactor operators...[in an emergency]... to raise the temperature prior to raising
13 the pressure." "Rather than fix its aging embrittled reactor vessel, PG&E's strategy for
14 Diablo Canyon Unit 1 is to repeatedly modify its mathematical calculations."⁴

15 Nuclear fuel, the metallic element uranium (U-235) refined and used in a nuclear power
16 plant, undergoes a chain reaction which emits a tremendous number of neutrons per second as
17 the atoms of uranium in the fuel split into other, lighter, radioactive elements.

18 Energy in uranium is released as heat to generate steam to generate commercial
19 electricity. The quantity of the neutrons moving through the fuel elements and the stainless steel
20 structure of the reactor holding the uranium fuel is known as the "Neutron Flux."

21 Embrittlement is a metallurgical change which occurs in the stainless steel of the reactor,
22 as the result of neutrons colliding with individual atoms of the metal comprising the structure
23 holding the fuel elements known as the reactor "core." Reactor embrittlement can cause an
24 atomic reactor to shatter like glass creating what the nuclear Regulatory Commission (NRC)
25 calls a Class 9 Accident, which is the worst nuclear catastrophe acknowledged by the NRC."⁵

26 ² "Irradiation Embrittlement and Creep in Fuel Cladding and Core Components," Published
27 January 1, 1973, ISBN: 0-7277-5117-4.

28 ³ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, page 4.

⁴ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, page 12.

⁵ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, page 3 of
24.

1 Embrittlement also affects the stainless steel of the pressure vessel⁶ above the core and its
2 welds, the piping which transports cool water into the core, and the high pressure stainless steel
3 piping that transports steam out of the core to the generator that transforms this steam into
4 commercial electricity.

5 The two reactors at Diablo Canyon were designed with predicted service lives of 25 years
6 under full power operation. Unit #1 went into full time service on May 7, 1985. Unit #1 has
7 been in actual full power operation for approximately 87% of the current period (33 years)
8 according to PG&E. That makes twenty nine years of full power. The power of the neutron flux
9 in the core can be judged when we realize that the energy is equal to 3 million horsepower at any
10 given moment. The originally predicted 25 years for safe operation for Units #1 and #2 was a
11 profession-wide estimate based on two decades of nationwide practical nuclear power
12 experience. The State of California has now scheduled the reactors to be decommissioned in
13 2025.

14 Metallurgical embrittlement is the reason the operation of a nuclear power plant is limited
15 and must be monitored for safety. Since 2001 nuclear industry experts such as Odette and Lucas
16 continue to acknowledge that the service life of old atomic reactors is limited by embrittlement.⁷
17 The petitioner, Paul Andrew Kangas offers this amicus brief to the court as this important fact is
18 not common public knowledge.

19 When Unit #1 was built small metal samples were positioned in the reactor. These are
20 referred to as “coupons.” Those samples are intended to be analyzed on a schedule in order to
21 compare the actual condition of the material of the reactor with the predicted state of
22 deterioration.

23 Pacific Gas & Electric has abandoned the schedule by not testing Unit #1’s “coupons”
24 since 2003. Unit #1 is four years past its safe design limit and 9 years beyond its original
25 license. Unit # 1 reached 70% of its design life in 2003 (17 years, from 1985).

26 ⁶ “Industry Practice for the Neutron Irradiation Embrittlement of Reactor Pressure Vessels in
27 Japan.” Norimichi Yamashita, Masanobu Iwasaki, Koji Dozaki, Naoko Soneda Journal of
28 Engineering for Gas Turbines and Power 132 (10), 102919, 2010.

⁷ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, pages 12-
13.

1 It is criminally negligent of PG&E to forego testing and fail to assess Unit #1's actual
2 state of deterioration. Since 2003 PG&E has intentionally hidden the state of deterioration from
3 the public.

4 The reactors at Diablo Canyon are exceptional among nuclear power plants because
5 being in California they are subject to large, sudden earthquakes. To save costs PG&E initially
6 tried to construct them with its own company engineers. Cutting corners left Unit #1 with a
7 weakened pressure vessel due to improper material in its welds. The NRC subsequently relaxed
8 its standards for welds to accommodate PG&E's error regarding Unit #1's welds.

9 Embrittlement makes it harder to safely turn off, or to "shut down," a nuclear reactor. A
10 single reactor continuously produces a gigawatt or more of electric power (More than a billion
11 watts.). Units #1 and #2 each produce over 1 gigawatt when operating. They are among the
12 biggest reactors ever built. A nuclear reactor can never be completely "turned off" unless all the
13 radioactive fuel rods are physically removed from its core. Active reactors are only slowed
14 down by lowering a large assembly of neutron absorbing material into the core to halt much of
15 the chain reaction, the "Control Rod Assembly."

16 What is not halted during "shut down" is the spontaneous decay in the fuel and the
17 continuing, albeit reduced, chain reaction caused by neutrons which are not captured by the
18 Control Rod Assembly. The amount of residual energy being released in the core after a "shut
19 down" is in fact still enormous, on the order of 250,000 hp.⁸ This equals the energy a 100,000
20 ton navy nuclear supercarrier generates at full power, 35 knots. During and after a "shut down"
21 cooling water must continue to be pumped into the core to keep the residual energy of the fuel
22 from melting the stainless steel of the reactor. Following an earthquake such action may cause
23 the deteriorated core to fracture causing a meltdown.

24 The very hot stainless steel of a very hot reactor core, at full power 1800 degrees
25 Fahrenheit, must be forced to cool off during an emergency at the same rate at which the "shut
26 down" is planned. During a rapid shut down after an earthquake severely embrittled stainless
27 steel is subject to cracking or shattering just as a piece of glass is, through rapid cooling, the rate
28 of which may not remain under control of the plant operator during an emergency shut down.

An operator attempting to introduce cool water into a reactor core during a rapid shut
down must use entirely different calculations of heat transfer, flow rate, and temperature than the

⁸ http://www.radioactivity.eu.com/site/pages/Reactor_Shutdown.htm

1 normal situation when the reactor is running a full power. An operator mistake following an
2 earthquake will cause a catastrophe. The faster the operator tries to shut down a nuclear reactor
3 the more likely the core will shatter resulting in a catastrophe like Fukushima, Japan that resulted
4 in severe local and global radiation contamination.

5 In the U.S. nuclear industry the first reactor ordered decommissioned due to the danger of
6 embrittlement was the Yankee Rowe Power Plant, in Rowe Massachusetts.⁹ Built in 1960,
7 Yankee Rowe went into an emergency shut down in 1992 after being struck by lightning. Upon
8 inspection, the deterioration of the core's metal was so much a danger that the plant was
9 permanently closed.

10 The Yankee Rowe plant went into an emergency shut down with no other associated
11 dangers. An earthquake at Diablo Canyon would cause additional dangers. Petitioner asks the
12 court to order PG&E to answer the embrittlement question by hiring a laboratory selected by the
13 court and completely independent from any dependency on PG&E.

14 Any size earthquake at Diablo Canyon could cause potential physical damage to intricate
15 components. Pumps could fail, high pressure steam pipes break loose, control panels suffer
16 damage. Any damage at all given the core's present condition can lead to a miscalculation
17 during the "shut down." "[T]he earthquake would cause a sudden emergency shutdown that
18 could defeat most safety systems, cause control room instruments to become unreliable because
19 of "instrument chatter"... and, thus provide the control room operators with little or no accurate
20 data about the temperature and pressure in the reactor."¹⁰

21 Further, in 2012, a highly respected employee of the Nuclear Regulatory Commission,
22 Dr. Michael Peck, used a rare procedure at the NRC to challenge PG&E's license to operate
23 Diablo Canyon, "due to erosion of regulatory margins" under the jurisdiction of the NRC. Dr.
24 Peck's statement September 23, 2014 was:

25
26 "Beginning in 2012, I used the Nuclear Regulatory Commission non-concurrence and
27 differing professional opinion (DPO) process to raise nuclear safety issues at Diablo
28 Canyon... the DPO asserted that PG&E continues to operate the Diablo Canyon reactors

26 ⁹ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, page 19.
27 "One U.S. reactor was so seriously embrittled (Yankee Rowe) that its owner decided to
28 permanently terminate its operating license and shut the reactor down..."

28 ¹⁰ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, pages 10-
11.

1 outside of the bounds as defined by the NRC Operating License, Any operation outside
2 of the design basis challenges plant safety due to erosion of regulatory margins.”

3 This challenge by a highly regarded engineer called on the NRC to reevaluate the
4 physical structure in light of the actual damage caused to the Fukushima reactors during the 2011
5 earthquake. Mr. Peck’s DPO in 2012 was made two years past the projected maximum safe
6 operating period of Diablo Canyon based purely on predicted metallurgical deterioration.

7 PG& E’s continued operation of the Diablo Canyon nuclear reactor is typical of the
8 utility’s distorted public relations campaign and is creating a danger to the public in pursuit of
9 profit.

10 Instead of promptly performing metallurgical testing to answer this safety question,
11 following Fukushima instead of engaging and using sound engineering to put real procedures
12 into effect, PG&E has established no new safety measures since 2010.

13 This time period corresponds to the explosion in San Bruno California on September 9th,
14 2010. In that case PG&E lied about both the condition of Line 132, and the pressure it was being
15 subject to. PG&E was unable to shut off the gas flaming into the Crestmore Neighborhood for
16 45 full minutes. This erupting flame blocked fire fighters and rescue into the neighborhood and
17 resulted in the destruction of dozens of homes. In the Camp Fire which recently totally
18 destroyed the community of Paradise California, PG&E again was unable to control the
19 machinery of its power production. PG&E could not shut off the electric power during a high
20 wind event. It could not shut off the gas supply and the company now has no certain way to shut
21 down the reactors of its Diablo Canyon nuclear power plant.

22 The company known as “PG&E the Utility” became a non-responding shell entity on
23 June April 6th, 2001 when the company known formerly as “Pacific Gas and Electric Company
24 split into two entities for the specific purpose of manipulating the California Energy Market
25 during a temporary price increase in domestic natural gas, and then to escape from responsible
26 regulation. Now the “Utility” is again asking for bankruptcy protection, while its twin, “PG&E
27 the Holding Company” has the actual profits made over time in its accounts and holds title to the
28 properties used by PG&E the “Utility”, including the nuclear power plant at Diablo Canyon.

29 Petitioner Paul Kangas suggests strongly to the Court that PG&E, “The Utility” is
30 nonfunctional under the original terms of its granted monopoly, which was granted to the former
31 single corporate entity “Pacific Gas and Electric Company” by the State of California. This is
32 the direct cause for the end of reasonable safety and maintenance of the power grid. The revenue

1 of the Power Plant at Diablo Canyon is a matter now in the bankruptcy proceeding. The Court
2 has the opportunity to act as a good manager and issue a temporary injunction.

3 The second metallurgical danger in Unit #1 is also caused by neutron flux embrittlement.
4 The stainless steel pressure vessel of Unit #1, unlike that of Unit # 2, was constructed with a
5 faulty welding material. The welding “sticks” contained excessive copper. This flaw came to
6 the Public’s attention in 1998 when the NRC issued an order to PG&E to produce weld
7 inspection data in order to determine if the pressure vessel of Unit #1 was unsafe to operate.
8 PG&E used the wrong material to weld stainless steel.

8 Quoting from the NRC:

9 “Several technical issues must be addressed as the vessels operate over long periods of
10 time... Reactor operation generates subatomic particles called neutrons. Some of these
11 neutrons hit atoms in the steel as they leave the core. These neutron impacts... make
12 steel brittle and less able to handle the stresses of operation... The percentage of copper
13 and nickel in the steel (the welds) also affects how... a vessel becomes embrittled.”

13 The pressure vessel must withstand 1000 to 2000 pounds/per/square inch of steam
14 pressure at 1800 degrees Fahrenheit when the reactor is operating at full power. The weaker
15 than designed welds in Unit #1 have been “temperature cycled” and “pressure cycled” each time
16 the reactor starts and shuts down over the 33-year operation of Unit #1.

16 The NRC required a complete ultrasound inspection every ten years of the welds made in
17 the construction of a pressure vessel in a nuclear plant. However, according to a noted educator
18 and nuclear engineer Arnie Gundersen of Fairewinds Energy, PG&E obtained a waiver from the
19 NRC in 2014. Thus, PG&E is in a second matter acting with criminal negligence to hide the
20 actual condition of the pressure vessel from the public, the California Public Utilities
21 Commission, and The California State Lands Commission.

21 Arnie Gundersen, provided this testimony to the CPUC on January 27th, 2017.

22 “While Diablo Canyon was in its 20-year construction period... More than 100 atomic
23 reactors were canceled after contracts were created, due to escalating construction costs
24 and delayed and unmanageable construction schedules. .. Diablo Canyon(‘s) cost
25 overruns were so significant that PG&E became an example of what could go wrong
26 during nuclear power plant design and construction. While the majority of utility
27 executives throughout the country began to recognize the enormous costs and risks of
28 building new nuclear power plants, and therefore chose to terminate construction in order
to minimize passing ever increasing costs on to their ratepayers, PG&E forged ahead.
PG&E passed the rapidly escalating Diablo Canyon cost overruns on to PG&E
ratepayers. Of the quagmire of issues associated with the 20-year construction period of
the Diablo Canyon the first serious mistake that PG&E made at the very onset of its
design process during the mid-1960s was the decision to use its own staff to engineer the

1 design and construction of the atomic power reactors at Diablo Canyon, rather than seek
2 the skills of an engineering firm fully experienced in... the complex engineering
3 necessary for atomic reactor construction projects. ... The inexperienced PG&E nuclear
4 power design and construction engineering staff made errors at Diablo Canyon that
5 created defects that impact its current operation. ... These flaws and defects include, but
6 are not limited to, PG&E's ... Use of the wrong welding material for the nuclear reactor
7 itself..."

8 The NRC requires a complete ultrasound inspection every ten years of the welds made in
9 the construction of a pressure vessel in a nuclear plant. However, in his testimony to the CPUC
10 on January 27, 2017 Arnie Gundersen further states that after its 25 year design limit had already
11 lapsed, and following Fukushima, PG&E obtained a waiver from the NRC to ignore the full
12 ultrasound inspection of Unit #1.

13 "Even though Diablo Canyon began operation in 1985, the atomic reactor for Unit 1 was
14 purchased approximately 20 years earlier and delivered to the Diablo Canyon Site in
15 1973. The Diablo Canyon reactor vessel was one of the first ever manufactured for the
16 nuclear power industry, by a company with no previous experience manufacturing a
17 commercial reactor vessel. As it turned out, PG&E used the wrong material to weld the
18 Diablo Canyon Unit 1 nuclear reactor pressure vessel. Because the nuclear industry was
19 in its infancy, it was not yet known that the material used to weld the Diablo Canyon Unit
20 1 reactor vessel is highly susceptible to radiation damage. ... Is Pacific Gas and Electric
21 frequently inspecting these embrittled welds in the Diablo Canyon Unit 1 reactor as a
22 result of this increased neutron embrittlement? No, PG&E does not plan to inspect these
23 embrittled welds with increased scrutiny. Normally, each weld of a nuclear reactor is
24 inspected every 10 years. (Instead) ... PG&E requested and the NRC approved
25 increasing this 10-year inspection interval to 20 years."

26 As American Society of Mechanical Engineers member Dr. Michael Peck states, PG&E
27 is operating Diablo Canyon outside of its original operating license. Gundersen continues:

28 "By letter dated August 18, 2014, as supplemented by a letter dated March 20, 2015,
Pacific Gas and Electric Company (the licensee) proposed an alternative to the in service
inspection (ISI) interval requirements of the American Society of Mechanical Engineers
Boiler and Pressure Vessel Code, Section XI, Paragraph IWB2412, "Inspection Program
B," for Diablo Canyon Power Plant (DCPP), Unit 1. Inspection Program B requires
volumetric examination of essentially 100 percent of reactor pressure-retaining welds
identified in Table IWB-2500-1 once each 10- year interval. Pursuant to Title 10 of the
Code of Federal Regulations (10 CFR), paragraph 50.55a(z) (50.55a(a)(3)(i) at the date
of application), the licensee requested to use a proposed alternative to extend the DCPP
Unit 1 reactor pressure vessel (RPV) inspection interval from 10 to 20 years. ... The U.S.
Nuclear Regulatory Commission (NRC) staff has completed its review of the licensee's
submittal and, as set forth in the enclosed safety evaluation, concludes that extending the
ISI interval from 10 to 20 years will provide an acceptable level of quality and safety...."

1 Previously, NRC regulations required that all the welds in the Diablo Canyon reactor be
2 ultrasonically inspected at least every 10 years. The current ten-year inspection period was to be
3 completed by the end of 2015. PG&E had previously committed to following the higher testing
4 standards of the American Society of Mechanical Engineers for inspecting the welds to
5 determine if flaws are developing. PG&E has thus reneged on its promise to the ASME to
6 remain fully within their professional judgment.

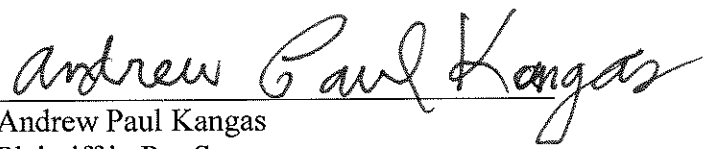
7 Unit #1 is known as one of the 5 most degraded reactor vessels of any now still operating.
8 "Currently there are 99 remaining nuclear reactors in the United States. Diablo Canyon Unit # 1
9 is one of the 5 most embrittled reactors in the United States."¹¹

10 PG&E is acting with gross criminal negligence to hide the condition of the pressure
11 vessel and core of Unit #1 from the Public, the California Public Utilities Commission, and The
12 California State Lands Commission. PG&E has intentionally chosen to disregard the most
13 important mode of testing the pressure vessel constructed on Unit #1, and which is constructed in
14 a specifically poor manner, which is susceptible to accelerated embrittlement.

15 PG&E, known for its "use-until-fail" maintenance policy, is asking the State of California
16 and the NRC to allow it to operate a facility which has the potential to destroy half of the
17 inhabitable area of California. For 20 years, 2005 to 2025, PG&E has been keeping itself in the
18 dark as to whether or not its nuclear reactor is safe.

19 Petitioner Paul Kangas requests that the Court enjoin PG&E from refueling Unit #1 to
20 conduct testing of the stainless steel and to order testing of the welds in the pressure vessel of
21 Unit #1. This mode of testing must be performed while the reactor is in shut down. At present a
22 good opportunity is available while the reactor is being prepared for refueling.

23 DATED: March 5, 2019

24 
25 Andrew Paul Kangas
26 Plaintiff in Pro Se
27 PG&E Shareholder

28 ¹¹ Arnie Gunderson, Fairewinds, testimony to CPUC, January 27, 2017, Appendix A, page 6.

1 CERTIFICATE OF SERVICE

2 (C.C.P. 1012, 1013, 2015.5)

3 Case No.: 19-30088

4
5 I certify that my mailing address is: c/o John F. Lee, Attorney at Law, 15 Boardman
6 Place, Second Floor, San Francisco, CA 94103 and I am a citizen of the United States, over 18
7 years of age, a resident of the County of San Francisco, and not a party within the action; I
8 served a true copy of the attached:

9 SUPPLEMENTAL AMICUS BRIEF

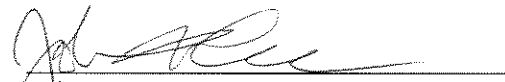
10 By first class mail, postage pre-paid on:

11 Stephen Karotkin
12 WEIL, GOTSHAL & MANGES LLP
13 767 Fifth Avenue
14 New York, NY 10153-0119

15 Tobias S. Keller
16 KELLER & BENVENUTTI LLP
17 650 California Street, Suite 1900
18 San Francisco, CA 94108

19 I certify under penalty of perjury that the foregoing is true and correct.

20 Dated: March 6, 2019

21 
22 John F. Lee
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